

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

Please amend the claims as shown.

1.-25. (Cancelled)

26. (Previously Presented) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

(1) reacting

(a) at least one donor substance selected from the group consisting of galactose and Gal β OR, where R is an organic group, and

(b) at least one acceptor substance which is a glucopyranosamino compound having the formula GlcNR"-R"',

wherein NR" is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R"' is a N-glycosidically bound lower alkoxy, a β -linked thioethyl, or a thiophenyl,

(c) in the presence of *Bullera singularis* or disintegrated cells from *Bullera singularis* or an E.C. group 3.2 glycosidase producing the desired lactosamine containing compound with β 1-4 linkage; and

(2) optionally isolating said lactosamine containing compound with β 1-4 linkage.

27. (Previously Presented) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

(1) reacting

(a) at least one donor substance selected from the group consisting of galactose and Gal β OR, where R is an organic group, and

(b) at least one acceptor substance which is a glucopyranosamino compound having the formula GlcNR''-R''',

wherein NR'' is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R''' is an O-, C-, or S-glycosidically bound lower alkoxy, a β -linked thioethyl, or a thiophenyl,

(c) in the presence of disintegrated yeast cells from *Bullera singularis* ;

and

(2) optionally isolating said lactosamine containing compound with β 1-4 linkage.

28. (Previously Presented) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

(1) reacting

(a) at least one donor substance selected from the group consisting of galactose and Gal β OR, where R is an organic group, and

(b) at least one acceptor substance which is a glucopyranosamino compound having the formula GlcNR"-R"',

wherein NR" is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R"' is a glycosidically bound fluoro or is a N-glycosidically bound aliphatic or aromatic compound,

with the proviso that if NR" is NHAc then R"' is not OH and if NR" is not NHAc then R"' may be OH,

(c) in the presence of *Bullera singularis* or disintegrated cells from *Bullera singularis* or an E.C. group 3.2 glycosidase producing the desired lactosamine containing compound with β 1-4 linkage; and

(2) optionally isolating said lactosamine containing compound with β 1-4 linkage.

29. (Previously Presented) The method according to claim 28, wherein R and R' are a group containing an aliphatic and/or aromatic group.

30. (Previously Presented) The method according to claim 29, wherein said aliphatic group is a alkyl, alkoxy, or allyloxy and wherein said aromatic group is phenyl, benzyl or phenyloxy.

31. (Previously Presented) The method according to claim 30, wherein said alkyl is methyl, ethyl or propyl and said alkoxy is methoxy or ethoxy.

32. (Previously Presented) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

(1) reacting

(a) at least one donor substance selected from the group consisting of galactose and Gal β OR, where R is an organic group, and

(b) at least one acceptor substance which is a glucopyranosamino compound having the formula GlcNR''-R''',

wherein NR'' is N-phthalimido, NH-C(O)-R, NHR or NRR' where R and R' are a group containing an organic and/or inorganic group,

wherein R''' is a glycosidically bound fluoro or is an O-, C-, or S-glycosidically bound aliphatic or aromatic compound,

with the proviso that if NR'' is NHAc then R''' is not OH and if NR'' is not NHAc then R''' may be OH,

(c) in the presence of disintegrated yeast cells from *Bullera singularis*; and

(2) optionally isolating said lactosamine containing compound with β 1-4 linkage.

33. (Previously Presented) The method according to claim 32, wherein R and R' are a group containing an aliphatic and/or aromatic group.

34. (Previously Presented) The method according to claim 33, wherein said aliphatic group is a alkyl, alkoxy, or allyloxy and wherein said aromatic group is phenyl, benzyl or phenyloxy.

35. (Previously Presented) The method according to claim 34, wherein said alkyl is methyl, ethyl or propyl and said alkoxy is methoxy or ethoxy.

36. (Previously Presented) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

(1) reacting

(a) at least one donor substance which is $\text{Glc}\beta\text{OR}$, where R is an organic group, and

(b) at least one acceptor substance which is a glucopyranosamino compound having the formula $\text{GlcNR}''\text{-R}'''$,

wherein NR'' is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R''' is an O-, C-, N-, or S-glycosidically bound lower alkoxy, a β -linked thioethyl, or a thiophenyl,

(c) in the presence of *Bullera singularis* or disintegrated yeast cells from *Bullera singularis* or an E.C. group 3.2 glycosidase producing the desired lactosamine containing compound with β 1-4 linkage; and

(2) optionally isolating said lactosamine containing compound with β 1-4 linkage.

37. (Previously Presented) A method of producing a lactosamine containing compound with β 1-4 linkage selected from the group consisting of $\text{Gal}\beta$ 1-4 $\text{GlcNPht}\beta\text{-Set}$, $\text{Gal}\beta$ 1-4 $\text{GlcNPht}\beta\text{-Ome}$, $\text{Gal}\beta$ 1-4 GlcNPht , $\text{Gal}\beta$ 1-4 $\text{GlcN}\beta$ 3 -Ome , and $\text{Gal}\beta$ 1-4 $\text{GlcNAc}\beta\text{-OphNO}_2\text{-p}$, the method comprising:

(1) reacting

(a) at least one donor substance selected from the group consisting of galactose and Gal β OR, where R is an organic group, and

(b) at least one acceptor substance which is a glucopyranosamino compound having the formula GlcNR''-R''',

wherein NR'' is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R''' is a N-glycosidically bound aliphatic or aromatic compound,

with the proviso that if NR'' is NHAc then R''' is not OH and if NR'' is not NHAc then R''' may be OH,

(c) in the presence of *Bullera singularis* or disintegrating yeast cells from *Bullera singularis* or an E.C. group 3.2 glycosidase producing the desired lactosamine containing compound with β 1-4 linkage; and

(2) optionally isolating said lactosamine containing compound with β 1-4 linkage.

38. (Previously Presented) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

(1) reacting

(a) at least one donor substance selected from the group consisting of galactose and Gal β OR, where R is an organic group, and

(b) at least one acceptor substance which is a glucopyranosamino compound having the formula GlcNR''-R''',

wherein NR'' is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R''' is a N-glycosidically bound aliphatic or aromatic compound,

with the proviso that if NR'' is NHAc then R''' is not OH and if NR'' is not NHAc then R''' may be OH,

(c) in the presence of *Bullera singularis* or disintegrated cells from *Bullera singularis* or an E.C. group 3.2 glycosidase producing the desired lactosamine containing compound with β 1-4 linkage; and

(2) optionally isolating said lactosamine containing compound with β 1-4 linkage; and

(3) adding a second enzyme, selected from an isomerase and an oxidase, which specifically removes glucose.

39. (Previously Presented) The method according to claim 38, wherein said isomerase is glucose isomerase.

40. (Previously Presented) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

- (1) reacting
 - (a) at least one donor substance comprising lactose, and
 - (b) at least one acceptor substance which is a glucopyranosamino compound having the formula GlcNR''-R''',

wherein NR" is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R'" is a N-glycosidically bound aliphatic or aromatic compound,

with the proviso that if NR" is NHAc then R'" is not OH and if NR" is not NHAc then R'" may be OH,

(c) in the presence of *Bullera singularis* or disintegrated cells from *Bullera singularis* or an E.C. group 3.2 glycosidase producing the desired lactosamine containing compound with β 1-4 linkage; and

(2) optionally isolating said lactosamine containing compound with β 1-4 linkage.

41. (Previously Presented) A method for the production of Lewis-x compounds, said method comprising:

(1) reacting

(a) at least one donor substance comprising lactose, and

(b) at least one acceptor substance which is a glucopyranosamino

compound having the formula GlcNR"-R'",

wherein NR" is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R'" is a N-glycosidically bound aliphatic or aromatic compound,

with the proviso that if NR" is NHAc then R'" is not OH and if NR" is not NHAc then R'" may be OH,

(c) in the presence of *Bullera singularis* or disintegrated cells from *Bullera singularis* or an E.C. group 3.2 glycosidase producing the desired lactosamine containing compound with β 1-4 linkage; and

(2) optionally isolating said lactosamine containing compound with β 1-4 linkage to form a peracetylated compound;

reacting said peracetylated compound with a fucopyranosyl compound;

and

subsequently removing the R groups and acetylating the NH₂ group.

42. (Previously Presented) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

(1) reacting

(a) at least one donor substance comprising lactose, and

(b) at least one acceptor substance which is a glucopyranosamino

compound having the formula GlcNR''-R''',

wherein NR'' is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R''' is a N-glycosidically bound aliphatic or aromatic compound,

with the proviso that if NR'' is NHAc then R''' is not OH and if NR'' is not NHAc then R''' may be OH,

(c) in the presence of an E.C. group 3.2 glycosidase obtained from a yeast, to form said lactosamine containing compound with β 1-4 linkage; and

(2) optionally isolating said lactosamine containing compound with β 1-4 linkage.

43. (Previously Presented) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

(1) reacting

(a) at least one donor substance comprising lactose, and

(b) at least one acceptor substance which is a glucopyranosamino

compound having the formula $\text{GlcNR}''\text{-R}'''$,

wherein NR'' is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R''' is a N-glycosidically bound aliphatic or aromatic compound,

with the proviso that if NR'' is NHAc then R''' is not OH and if NR'' is not NHAc then R''' may be OH ,

(c) in the presence of a recombinant β -galactosidase with the amino acid sequence of an E.C. group 3.2 glycosidase obtained from a yeast, to form said lactosamine containing compound with β 1-4 linkage.

44. (Previously Presented) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

(1) reacting

(a) at least one donor substance selected from the group consisting of galactose and $\text{Gal}\beta\text{OR}$, where R is an organic group, and

(b) at least one acceptor substance which is a glucopyranosamino compound having the formula $\text{GLcNR}'' - \text{R}'''$,

wherein NR'' is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R''' is a N-glycosidically bound lower alkoxy,

(c) in the presence of a crude, partially isolated or isolated form of E.C. group 3.2 glycosidase producing the desired lactosamine containing compound with β 1-4 linkage; and

(2) optionally isolating said lactosamine containing compound with β 1-4 linkage.

45. (Previously Presented) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

(1) reacting

(a) at least one donor substance selected from the group consisting of galactose and $\text{Gal}\beta\text{OR}$, where R is an organic group, and

(b) at least one acceptor substance which is a glucopyranosamino compound having the formula $\text{GLcNR}'' - \text{R}'''$,

wherein NR'' is N-phthalimido, NH-C(O) -R , NHR or NRR' where R and R' are a group containing an organic and/or inorganic group,

wherein R''' is a N-glycosidically bound aliphatic or aromatic compound,

with the proviso that if NR'' is NHAc then R''' is not OH and if NR'' is not NHAc then R''' may be OH,

(c) in the presence of a crude, partially isolated or isolated form of E.C. group 3.2 glycosidase producing the desired lactosamine containing compound with β 1-4 linkage; and

(2) optionally isolating said lactosamine containing compound with β 1-4 linkage.

46. (Previously Presented) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

(1) reacting

(a) at least one donor substance lactose, and

(b) at least one acceptor substance which is a glucopyran-osamino

compound having the formula GLcNR''-R''',

wherein NR'' is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R''' is a N-glycosidically bound aliphatic or aromatic compound,

with the proviso that if NR'' is NHAc then R''' is not OH and if NR'' is not NHAc then R''' may be OH,

(c) in the presence of an E.C. group 3.2 glycosidase obtained from a yeast, in crude, partially isolated or isolated form, to form said lactosamine containing compound with β 1-4 linkage.

47. (Previously Presented) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

(1) reacting

(a) at least one donor substance lactose, and

(b) at least one acceptor substance which is a glucopyranosamino

compound having the formula $\text{GLcNR}''\text{-R}'''$,

wherein NR'' is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R''' is a glycosidically bound aliphatic or aromatic compound,

with the proviso that if NR'' is NHAc then R''' is not OH and if NR'' is not NHAc then R''' may be OH ,

(c) in the presence of a recombinant β -galactosidase with the amino acid sequence of an E.C. group 3.2 glycosidase obtained from a yeast, in crude, partially isolated or isolated form, to form said lactosamine containing compound with β 1-4 linkage.

48. (New) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

(1) reacting

(a) at least one donor substance selected from the group consisting of galactose and $\text{Gal}\beta\text{OR}$, where R is an organic group, and

(b) at least one acceptor substance which is a glucopyranosamino compound having the formula $\text{GlcNR}''\text{-R}'''$,

wherein NR'' is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R''' is an O-, C-, S- or N-glycosidically bound lower alkoxy, a β -linked thioethyl, or a thiophenyl,

(c) in the presence of an enzyme which is β -galactosidase from *Bullera singularis* or disintegrated cells from *Bullera singularis* or recombinant form thereof or an E.C. group 3.2 glycosidase producing the desired lactosamine containing compound with β 1-4 linkage; and

(2) optionally isolating said lactosamine containing compound with β 1-4 linkage.

49. (New) The method according to Claim 48, wherein the donor is lactose.

50. (New) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

(1) reacting

(a) at least one donor substance which is a glycoside or a disaccharide,

and

(b) at least one acceptor substance which is a glucopyranosamino compound having the formula GlcNR''-R''',

wherein NR'' is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R''' is an N-, O-, C-, or S-glycosidically bound lower alkoxy, a β -linked thioethyl, or a thiophenyl,

(c) in the presence of a β -galactosidase from *Bullera singularis* ; and

(2) optionally isolating said lactosamine containing compound with β 1-4 linkage.

51. (New) A method of producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

- (1) reacting
- (a) at least one donor substance selected from the group consisting of galactose and Gal β OR, where R is an organic group and a hydroxy group of the Gal is substituted by an organic group, and
- (b) at least one acceptor substance which is a glucopyranosamino compound having the formula GlcNR''-R''',
- wherein NR'' is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,
- wherein R''' is a glycosidically bound fluoro or is an O-, C-, S- or N-glycosidically bound aliphatic or aromatic compound,
- with the proviso that if NR'' is NHAc then R''' is not OH and if NR'' is not NHAc then R''' may be OH,
- (c) in the presence of an enzyme which is β - galactosidase from *Bullera singularis* or disintegrated cells from *Bullera singularis* or recombinant thereof or an E.C. group 3.2 glycosidase producing the desired lactosamine containing compound with β 1-4 linkage; and
- (2) optionally isolating said lactosamine containing compound with β 1-4 linkage.

52. (New) The method according to claim 51, wherein the donor is lactose.
53. (New) The process of claim 51, wherein said enzyme is immobilized.
54. (New) The method according to claim 51, wherein R and R' are a group containing an aliphatic and/or aromatic group.
55. (New) The method according to claim 48, which produces Gal β 1-4Gal β 1-4Glc NR''R''.
56. (New) The method according to claim 48, wherein a solvent is present.
57. (New) The method according to claim 48, wherein reacting takes place at a temperature of up to 75°C in water rich medium at a pH of 4-8.
58. (New) The method according to claim 48, wherein the concentration of the acceptor is about 0.05 to 7 M.
59. (New) The method according to claim 48, wherein the glycosidase is used *in vivo* or *in vitro*.
60. (New) The method according to claim 48, wherein the glycosidase is in recombinant form with at least 70% homology.
61. (New) The method according to claim 48, wherein the lactosamine is isolated by extraction, chromatography or precipitation.
62. (New) The method according to claim 48, wherein the enzyme is in soluble form or immobilized to a solid support.
63. (New) The method according to claim 48, further comprising adding a second enzyme which converts the lactosamine to another desired product.

64. (New) The method according to claim 48, further comprising reacting the lactosamine product with α -sialyltransferase to form a sialylated Gal-Glc NAc derivative.

65. (New) The method according to claim 63, wherein the second enzyme is a lipase, a sulfatase, a glycosyltransferase, or an oxidase.

66. (New) A method according to claim 48 for the syntheses of Gal β 1-4Glc NPht- β SEt comprising:

cultivating *Bullera singularis* at 25° C with agitation in a medium containing 5% lactose, 1% GlcNPht β SEt which has been sterile filtered with yeast extract, continuing reaction until lactose is essentially consumed, separating yeast cells, extracting a water-phase with ethyl acetate, extracting the water phase with butanol, evaporating the butanol, dissolving residue in aqueous ethanol, evaporating the ethanol and precipitating product from water to thereby isolate product.

67. (New) A method according to claim 48 for the synthesis of Gal β 1-4Glc NPht- β -OMe comprising reacting β -linked nitrophenyl glycoside of galactose and GlcNPht β -SEt in a solvent in the presence of β -galactosidase, optionally extracting and recovering product.

68. (New) A method according to claim 48 for the synthesis of Gal β 1-4GlcNPht comprising reacting β -linked nitrophenyl glycoside of galactose, Gal β -OPhNO₂-O with GlcNPht in a solvent in the presence of β -galactosidase, optionally extracting and recovering product.

69. (New) A method according to claim 48 for the synthesis of Gal β 1-4GlcN₃ β -OMe comprising reacting β -linked nitrophenyl glycoside of galactose with Gal β OPhNO₂-O in the presence of a solvent and β -galactosidase, wherein N₃ represents the azido group, optionally isolating and recovering product.

70. (New) A method according to claim 48 for the synthesis of Gal β 1-4GlcNAc β -SEt comprising reacting β -linked nitrophenyl glycoside of galactose with GlcNAc β -SEt in the presence of a solvent and β -galactosidase, optionally isolating and recovering product.

71. (New) A method according to claim 48 for the synthesis of Gal β 1-4GlcNAc β -OPhNO₂-p comprising reacting lactose and p-nitrophenyl β -D-N-acetyl-glucosamine in the presence of β -galactosidase, optionally isolating and recovering product.

72. (New) A method for the production of Lewis-x compounds, said method comprising:

(1) reacting

(a) at least one donor substance comprising lactose, and

(b) at least one acceptor substance which is a glucopyranosamino

compound having the formula GlcNR''-R''',

wherein NR'' is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R''' is a N-glycosidically bound aliphatic or aromatic compound,

with the proviso that if NR'' is NHAc then R''' is not OH and if NR'' is not NHAc then R''' may be OH,

(c) in the presence of *Bullera singularis* or disintegrated cells from *Bullera singularis* or recombinant thereof or an E.C. group 3.2 glycosidase producing the desired lactosamine containing compound with β 1-4 linkage; and

(2) peracetylating said lactosamine containing compound with β 1-4 linkage to form a peracetylated compound;

reacting said peracetylated compound with a member selected from the group consisting of a fucopyranosyl compound, mannose, galactose or other sugar; and

subsequently removing the R groups and acetylating the NH_2 group.

73. (New) A method according to claim 48 for producing a lactosamine containing compound with β 1-4 linkage, said method comprising:

(1) reacting

(a) at least one donor substance selected from the group consisting of galactose and $\text{Gal}\beta\text{OR}$, where R is an organic group, and

(b) at least one acceptor substance which is a glucopyranosamino compound having the formula $\text{GlcNR}''\text{-R}'''$,

wherein NR'' is an azido, 2-N-acetyl-, 2-N-phthalimido, or another compound containing an inorganic and/or organic group bound to the 2-N-group of glucosamine,

wherein R''' is a O-, C-, S- or N-glycosidically bound aliphatic or aromatic compound,

with the proviso that if NR'' is NHAc then R''' is not OH and if NR'' is not NHAc then R''' may be OH,

(c) in the presence of an enzyme which is β -galactosidase from *Bullera singularis*, or disintegrated cells therefrom or a recombinant form or an E.C. group 3.2 glycosidase obtained from a yeast, to form said lactosamine containing compound with β 1-4 linkage; and

- (2) optionally isolating said lactosamine containing compound with β 1-4 linkage;
- (3) using said lactosamine as an acceptor compound and reacting with CMP-NeuAc in the presence of α 2-3 sialyltransferase as catalyst to thereby obtain the corresponding α 2-3 silylated lactosamine.